

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

INTRODUCTION

The proposed FPL Energy North Dakota Wind Energy Center (Edgeley/Kulm Project) is a direct result of the cooperative effort among Western, Dakota Wind, Basin, and Basin's member cooperatives. Basin and its members would purchase the output of the proposed project, which would be constructed, owned, and operated by Dakota Wind. The proposed project is scheduled to be operational by the end of 2003.

PROPOSED ACTION

The proposed 21-MW (based on average daily output) Edgeley/Kulm Project is located near the rural communities of Kulm and Edgeley in south-central North Dakota. The legal description of the proposed windfarm is Township 133 North, Range 65 West, Sections 7, 8, 17, 18, 19, 20, and 29 (**Figure 2-1**).

The proposed project would consist of modifying Western's Edgeley Substation; constructing, operating, and maintaining transmission lines and a collection substation; and constructing, operating, and maintaining the windfarm. The following sections describe these three project components.

SUBSTATION MODIFICATION

Location of Western's Edgeley Substation relative to the other project components is shown on **Figure 2-1**. Western would construct modifications to the substation to handle the addition of a line bay from the proposed windfarm. Modifications would include:

- Constructing a main and transfer bus that would include the addition of the 115-kV windfarm line bay, transfer bay, and replacing the existing Jamestown line bay.
- Replacing a two-pole wood transmission line structure with a three-pole structure adjacent to the substation on the existing right-of-way (ROW) for the Jamestown-Edgeley 115-kV transmission line.
- Expanding fences outward on the east and north sides of the property to accommodate the bay additions.

Western's Edgeley Substation occupies a square, 500 feet by 500 feet parcel. Upon approval of the proposed Edgeley/Kulm Project, Western would purchase an additional 130 feet of property extending to the north, and an additional 80 feet of property extending to the east to accommodate substation modifications. An approximate 30-foot wide strip of the northward expansion would be granted to the Dickey Rural Water District for a water line easement. Properties bordering the substation to the north and east are used for agricultural purposes.

TRANSMISSION LINE AND COLLECTOR SUBSTATION

Collection and Transmission System

The proposed Edgeley/Kulm Project collection and transmission system would collect energy generated by the proposed windfarm and transmit it to Western's Edgeley Substation. Central Power Electric Cooperative (Central Power), a

Basin Electric Power Cooperative member, would construct portions of the transmission system.

Dakota Wind – Collection System

Dakota Wind would construct a radial feed collection system from 27 individual wind turbines. Individual collection lines from pad-mounted transformers at the base of the towers would mostly be buried in trenches along wind turbine access roads that are shown on **Figure 2-1**. These would be joined in a common, approximately 2.5-mile long trench along the west edge or beneath the Pomona Township Road. This buried line would connect to the proposed collection substation proposed at the southwest corner of the Pomona Township Road and State Highway 13 intersection. Dakota Wind would purchase approximately 2 to 3 acres required for the collection substation from the respective landowner at fair market value. Trenches (both individual and common) are anticipated to be approximately 2 feet wide, and 4 feet deep. Disturbance associated with all buried collection lines would be limited to a 100-foot construction ROW. All disturbances would be restored following burial of the electrical cables, and above ground utility warning markers would be installed at appropriate intervals. The pad-mounted transformers would be located within 20 feet of the base of each turbine tower. The approximate 5-foot square steel transformer box housing the transformer circuitry would be mounted on an approximate 6-foot square concrete slab. The picture insert on **Figure 2-2** shows a typical pad mounted transformer and its location near the base of the turbine tower.

Central Power – Transmission System

Central Power would construct approximately 10 miles of 115-kV overhead transmission line along State Highway 13

to connect the collector substation to Western's Edgeley Substation. Routing the buried and overhead transmission lines along the Pomona Township Road and State Highway 13 is intended to avoid farms, housing, and sensitive areas such as wetlands. Central Power would provide fair market compensation to landowners for easements within the proposed transmission line ROW.

The transmission line constructed for the proposed project would be in accordance with National Electrical Safety Code, U.S. Department of Labor Occupational Safety and Health Standards, and Central's Power System Safety Manual for maximum safety and property protection. Overhead transmission line construction along State Highway 13 would occur within a 100-foot construction ROW, with an operational ROW maintained at a 50-foot width. Single wood-pole structures would be installed within the ROW. **Figure 2.3** shows a typical single wood-pole 115-kV transmission structure.

The wood-pole structures for transmission lines have a 100 percent replacement factor in 45 years. However, there are several advantages in using wood poles: they are readily available; they can be installed using simple construction techniques; and, in emergencies, they can be easily modified or replaced to reduce outage time.

New poles are typically buried 10 percent of the pole length plus 2 feet (i.e., an 80-foot pole would be buried 10 feet) and spaced approximately 350 feet apart. Using these spacing standards would require approximately 15 structures per mile. Disturbance at each pole site would likely average 50 feet by 50 feet confined to the 100-foot construction ROW.

Figure 2-1

blank

Figure 2-2

blank

figure 2-3

blank

Construction tasks would include the following:

- *Pre-Construction* -- Includes activities such as environmental, geotechnical, cultural, avian, micro-siting, engineering, design, land procurement, various utility studies, and major procurement.
- *Surveying* -- Initial line-survey work, consisting of survey control, route centerline location, profile surveys, and access surveys.
- *Wood-Pole Structures* -- Vegetation would be removed from a limited area at structure locations. Once any vegetation is removed, holes would be drilled for structures using a truck-mounted auger.
- *Delivery and Assembly* -- The pre-assembled wood-pole structures would be transported to the erection sites on flatbed trucks. The footings of each would be backfilled with drill cuttings and tamped into place to prevent structure movement or settling. Final structure assembly and hardware placement would be completed using man-lift trucks. Guy wires would be screwed into the ground in accordance with standard construction practices.
- *Conductor Installation* -- Following erection of all wood-pole structures, conductor and ground wires would be installed. Conductor would be pulled and tensioned from several locations (approximately every two miles) along the transmission line route. Heavy, truck-mounted winches that also carry reels of conductor and cable would be used for pulling and tensioning work.

Figure 2-4 provides a diagram of basic

wire-handling equipment and technique.

- *Restoration* -- Finally, all disturbed areas associated with transmission line construction would be restored to pre-construction condition.

Table 2-1 summarizes transmission line design characteristics specific to the proposed Edgeley/Kulm Project. Electrical conductors provide the medium for flow of electrical energy. The conductor consists of strands of reinforced steel cable encased by aluminum strands. The steel cable provides the tensile strength to support the conductor; the aluminum conducts the electrical current.

Insulators and hardware used on the line would be standard design to provide nearly corona free operation, as well as reduce audible noise and radio and television interference. The typical suspension structure would be configured with three vertical stacks of polymer insulators. One over-head galvanized steel ground wire, approximately 3/8-inch diameter, would be installed on one side of the top of the structure to provide lightning protection.

The proposed collection substation would be located at the southwest corner of the Pomona Township Road and State Highway 13 intersection. The fenced substation facility would occupy an approximate 275 feet by 300 feet area of an approximate 2-acre parcel.

TABLE 2-1
Overhead Transmission Line Design Characteristics
Proposed Edgeley/Kulm Project

Design Element	Characteristic
Line Length (approximate)	10 miles
Width of Construction Right-of-Way (ROW)	100 feet
Width of Operational Right-of-Way (ROW)	50 feet
Thermal Capacity for 115 kV	200 amps
Voltage	115 kV
Circuit Configuration	Vertical Stacked (3)
Conductor Size	T2-266ACSR 26/7
Conductor Type	Twisted Pair (T2)
Electric field at edge of 50' operational ROW	0.2737 kV/meter (3' above ground)
Magnetic field at edge of 50' operational ROW (thermal limit)	7.4 Milligauss (3' above ground @ 40 Mega Volt Ampere (MVA))
Electrostatic short-circuit current limit	7.7 kA for 1 second
Structures: type and number per mile	Transmission Poles - 115 spaced @ 15 per mile
Structure Height	61' above ground level typical
Length of Span	350 feet
Minimum Ground Clearance of Conductor	24 feet @ 212° Fahrenheit
Typical Structure Base Dimensions	30 inch diameter
Land temporarily disturbed per site for conductor reel and pole storage yards	Materials would be stored in an existing storage yard.
Area required for each structure base	3 feet x 3 feet

WINDFARM

The proposed windfarm would be located in portions of Section 7, 8, 17, 18, 19, 20, and 29 in Pomona View Township, La Moure County, North Dakota. A possible array of the 27 proposed wind turbines is shown on **Figure 2-5**. Siting considerations include:

- Anticipated 300-foot radius zone of influence of individual turbines based on turbulence and ice throw;
- Proposed 1,000-foot radius for safety, noise, vibration, and shadow flicker buffer zones for residences; and,
- Wetland boundaries based on the National Wetland Inventory (NWI) and USFWS databases.

Figure 2-6 provides a diagram and photograph of the General Electric (GE) horizontal axis, 3-blade propeller turbines. approximate height of the turbines would

be 360 feet from the top of the swept area to the ground surface. The bottom of the swept area above the ground surface would

be approximately 160 feet. These heights would allow the turbines to take advantage of more consistent, less turbulent winds aloft.

The operational footprint of each wind tower approximates 50 feet by 50 feet, equating to approximately 1.5 acres for the proposed windfarm. The wind area under lease for a particular turbine may be up to 30 to 50 acres of land.

Computer systems inside each turbine would perform self-diagnostic tests, and allow a remote operator to set new operating parameters, perform system checks, and ensure turbines are operating at peak performance. Turbines would automatically shut down in sustained winds of 56 miles per hour (mph) or gusts of about 100 mph.

Figure 2-4

blank

Figure 2-5

blank

Figure 2-6

blank

Construction of the wind turbines would be relatively quick in comparison to other types of power plants. Dakota Wind and Basin expect to bring the proposed Edgeley/Kulm Project on-line in a matter of months once easement agreements and construction permits are in place. Although construction impacts would be temporary and short-lived, heavy equipment, including bulldozers, graders, trenching machines, concrete trucks, flatbed trucks, and large cranes, would be required.

Windfarm construction typically occurs in the following sequence:

- *Civil Construction* -- Usually performed about three to six weeks before any other phase of construction begins. Entails surveying, cleaning, grubbing, grading, excavation, and foundation construction. In connection, it would also include civil work on support facilities such as laydown areas (approximately 3 acres), portable ready mix facilities, if applicable, construction office, and employee parking areas (approximately 2-3 acres).
- *Delivery and Access* -- Major wind turbine components including rotor assemblies, towers, power cable, and transformers would be delivered to the windfarm site by flatbed, semi-tractor-trailers. A 350-foot wide construction area would be required alongside the turbine sites for rotor assembly, installation, and underground electrical, road, and access way construction. Access roads constructed from nearby State Highway 13 and Pomona Township Road would be graded and compacted to a total width of 35 feet for large crane travel. Permanent road easement would be reduced to 40 feet, with a permanent access road travel width of approximately 15 feet remaining after construction.
- *Electrical* -- Includes the underground collection system that interconnects into Western's transmission system via the overhead high voltage transmission lines and substation that were previously discussed. This phase typically starts three to four weeks after the civil construction phase.
- *Structural* -- Encompasses wind turbine and tower assembly, and erection onto turbine foundations. This phase would also include installation of all mechanical and electrical systems associated with the turbines. Typically, this phase would occur six to eight weeks following the beginning of civil construction.
- *Testing* -- This phase would start well into the proposed project, usually three to six months after the start of construction, and would typically last two to three months. This phase would include all the testing required to make the windfarm commercially operational. This incremental process would include energizing the interconnect substation, and bringing each turbine on line until commercial operation date would be declared.
- *Restoration and Final Project Completion* -- This final phase in windfarm construction would entail restoration and clean-up of all project disturbances. Erecting necessary

signs, and gates, identifying permanent operations and maintenance facilities on the final walk down, and acceptance of the windfarm would be included in this final task.

A photo series depicting the typical process of erecting a turbine is located in **Appendix A**.

ENVIRONMENTAL PROTECTION MEASURES

Several documents would provide environmental protection guidance to Dakota Wind, Basin, and Central Power. These documents would include FPL Energy General Bidding Instructions, FPL Energy Best Management Practices (BMPs), Western's Construction Standard 13 (Western 2001), North Dakota Department of Health permits, USFWS and USGS agreements, and *Raptor-safe* power line construction practices (EEI 1996). FPL Energy formally agreed to comply with guidelines and requirements outlined in Western's Construction Standard 13 in a letter provided to Western dated March 17, 2003 (Beichel 2003). Summaries and/or applicable parts of each of these documents follow.

FPL Energy General Bidding Instructions

Included in FPL Energy's instructions to prospective contractors bidding on construction of the proposed Edgeley/Kulm Project would be environmental protection requirements. Several noteworthy requirements identify the contractor as responsible for the following:

- *Solid and Sanitary Waste Disposal* -- Contractor shall pick up solid wastes and place in containers that are regularly emptied, dispose of garbage in approved containers that are regularly emptied, and prevent contamination of the proposed project site and other areas when handling and disposing of wastes. Upon completion of the work, Contractor shall leave the work areas clean, and control and dispose of wastes.
- *Petroleum Products* -- Contractor shall conduct fueling and lubrication of equipment and motor vehicles in a manner to protect against spills and evaporation, and shall dispose of unused lubricants and oils.
- *Dust* -- Contractor shall implement dust control at all times in accordance with applicable local and state requirements. Contractor shall keep dust down at all times during construction. Air blowing would be permitted only for cleaning non-particulate debris such as steel reinforcing bars. Contractor shall not permit the shaking of bags of cement, concrete mortar, or plaster.
- *Temporary Construction* -- Contractor shall remove temporary construction facilities (erected by and within Contractor's scope), including access road-entrance-way build ups, access road corner widenings, crane pads, work areas, structures, foundations of temporary structures, and stockpiles of excess or waste materials.

- *Protection of Roads* -- Contractor shall plan and practice measures to minimize the impact to the existing landowner, township, county and state roads. Measures shall include demanding low speed limits for heavy vehicles and equipment traveling on the roads. Any road damage caused by construction activities shall be repaired by Contractor.

FPL Energy Best Management Practices During Windfarm Construction

FPL Energy developed BMPs for a similar windfarm project in Gray County, Kansas. These include:

- *Disturbance Minimization* -- The proposed windfarm project would be constructed to fit the existing terrain, thereby eliminating land-disturbing cut and fill activities, minimizing disturbance to existing drainage, and reducing soil erosion potential.
- *Sediment Control* -- Potential sediment movement to nearby drainages and wetlands resulting from construction disturbance would be controlled by installing silt fencing on the downhill side of access roads along low areas, and installing gravel entrances at county roads prior to grading activities to prevent vehicle tracking.
- *Fueling and Equipment Maintenance* -- Construction equipment would be fueled and maintained at an equipment maintenance staging area that would be designed to contain spills. Accidental spills would be cleaned up immediately following state regulations.

- *Reclamation/Revegetation* -- Areas disturbed during construction would be graded to blend with the natural terrain, scarified, and seeded with species at landowner request or with regionally native species.
- *Inspection/Maintenance* -- Silt fencing would be inspected within 24 hours of each rain event of 1/2 inch or greater, maintained by removing sediment after a 50 percent loss of capacity, and replaced as necessary.

FPL Energy Best Management Practices During Windfarm Operation

Dakota Wind, Basin, and Central would continue to follow FPL Energy BMPs during operation of the proposed windfarm. These specifically include:

- *Access Road Maintenance* -- Permanent access road gravel surfaces within the proposed windfarm would be maintained to ensure positive drainage and minimize sediment runoff.
- *Noxious Weed Control* -- Areas disturbed during construction would be monitored for infestation by noxious weeds at regular intervals coinciding with routine windfarm maintenance and monitoring activities. La Moure County contracts its noxious weed spraying services to area landowners, or, if not contracted, requests that a courtesy weed control plan is filed with the County Weed Control Officer (Evert 2003).

- *Revegetation Monitoring* -- Re-seeding efforts using native grass seed mixes on areas disturbed during construction that are not being used for crop production would be monitored for success annually (in the spring) for two years following construction. If revegetation efforts are not or only partially successful, appropriate re-seeding measures would be taken.

Western Construction Standard 13 During Windfarm Construction and Operation

Western's *Construction Standard 13, Environmental Quality Protection* document would provide general guidance for environmental protection during both the construction and operation of the proposed Edgeley/Kulm Project (Western 2001). A copy of *Construction Standard 13* is provided in **Appendix B**. Several noteworthy standards provided by Western include the following:

- *Landscape Preservation (Section 13.3)* -- Includes guidance to preserving landscape features, constructing and restoring construction roads, and constructing and restoring construction facilities such as offices and storage yards.
- *Preservation of Cultural Resources (Section 13.4)* -- Provides for treatment and notification of known or discovered cultural sites or artifacts.
- *Noxious Weed Control (Section 13.5)* -- Requires a "clean vehicle policy" while entering and leaving construction areas to prevent transport of noxious weed plants and/or seed.
- *Disposal of Waste Material (Section 13.8)* -- Requires removal and disposal of all waste material generated during construction.

- *Pollutant Spill Prevention, Notification, and Cleanup (Section 13.10)* -- Requires measures to prevent spills of pollutants and respond appropriately if a spill occurs. Includes any solvent, fuel, oil, paint, pesticide, engine coolants, and similar substances.
- *Prevention of Air Pollution (Section 13.13)* -- Ensures that construction activities and equipment operation are undertaken to reduce air pollutant emissions, and that nuisance dust shall be controlled.

North Dakota Department of Health Permits

Beginning March 10, 2003, land disturbance from 1 to 5 acres in size requires a storm water permit issued by the North Dakota Department of Health, Division of Water Quality. The permit, along with the associated notice of termination, requires that disturbed soils are stabilized, vegetative cover restored, temporary erosion control measures removed, and all storm water discharges associated with construction activity have been eliminated.

Discussions with North Dakota Department of Health and Pomona Township Board personnel indicate that FPL Energy Contractor requirements and BMPs, along with Western's *Construction Standard 13*, would satisfy state air quality requirements. However, Department of Health and Township Board personnel did request courtesy notification (Bachman 2003), and have specified control of fugitive dust.

Migratory Bird Baseline Investigation and Monitoring Program

Dakota Wind and its partners have agreed to cooperatively participate with the USFWS and USGS in a *Migratory Bird Baseline Investigation and Monitoring Program*. The study objective is to determine whether wind turbine placement in native prairie affects upland-nesting migratory birds, breeding-bird density and species composition. The baseline investigation has been completed. USGS personnel would implement post construction monitoring at the time of windfarm start-up. In addition, Dakota Wind personnel would periodically conduct carcass searches at the windfarm to document any migratory bird mortality.

Because of the proposed project's location near a high density of wetlands and large populations of nesting and migratory species, these investigation and monitoring efforts would provide baseline data to USFWS and USGS for future planning and regulation of wind energy projects.

Raptor-Safe Power Line Construction Practices:

Central Power would apply *Suggested Practices for Raptor Protection on Power Lines*, developed by The Edison Electric Institute (EEI), Avian Power Line Interaction Committee (APLIC), to the design and construction of overhead transmission line power structures and the collection substation (EEI 1996). Appropriate suggested practices derived from EEI's document are identified and described below.

- Use of alternate positions for overhead groundwire to make available pole tops perching.
- Installation of polyvinyl chloride downwire moulding on groundwire and insulation on insulator bases and bolts.
- Installation of perch guards on horizontal insulators.

PROJECT ALTERNATIVES**NO ACTION ALTERNATIVE**

Under the no action alternative, Western would not modify the Edgeley Substation to accommodate power produced by the proposed project. The proposed 10 mile, 115-kV transmission line would not be constructed along State Highway 13 from the proposed collection substation to Western's Edgeley Substation. The 27 wind turbines associated with the proposed Edgeley/Kulm Project would not be constructed.

Disturbance, noise, and impacts related to an influx of construction work associated with the various phases of the proposed Edgeley/Kulm Project would not occur.

**ALTERNATIVES CONSIDERED BUT
ELIMINATED FROM DETAILED
ANALYSIS**

During initial development stages of Dakota Wind's proposed windfarm project, Dakota Wind proposed to site the facility within Basin's transmission area. To minimize disturbance, the windfarm was sited as near an existing transmission substation as possible. These considerations, coupled with readily available wind data and other siting factors (e.g. wetlands avoidance, distance from known floodplains), resulted in siting the proposed windfarm at the proposed location.

Dakota Wind also considered using 660-kilowatt turbines manufactured by Vestas. However, to reduce the total number of turbines to produce the desired amount of electrical energy, Dakota Wind chose to use GE 1.5-MW turbines, thereby reducing the total number of wind turbines for the project by approximately half. This would result in less surface disturbance, a shorter construction schedule, and would reduce potential for waterfowl collisions.